



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/731,157	12/10/2003	Eiju Komuro	246408US2	4795
22850	7590	03/31/2005	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			SUMMONS, BARBARA	
			ART UNIT	PAPER NUMBER
			2817	

DATE MAILED: 03/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/731,157

Applicant(s)

KOMURO ET AL.

Examiner

Barbara Summons

Art Unit

2817

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6-20 is/are allowed.
- 6) ☒ Claim(s) 1 is/are rejected.
- 7) ☒ Claim(s) 2-5 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. ____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>5/28/04 & 12/10/03</u> | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because the last line thereof should be deleted. Correction is required. See MPEP § 608.01(b).

2. The abstract of the disclosure is also objected to because it is too long, that is, longer than 150 words (see below).

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

4. Claims 6, 11 and 16 are objected to because of the following informalities:

Art Unit: 2817

In each of claims 6, 11 and 16, on the last line thereof, for clarity only, the Examiner suggests inserting after the last word, "frequency", - - exhibiting the other attenuation extremum - - (see the prior 4 to 5 lines of each claim). This change simply clarifies what frequency is meant by "the other frequency".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claim 1 is rejected under 35 U.S.C. § 102(b) as being anticipated by Ella U.S. 5,910,756.

Fig. 11a of Ella discloses a piezoelectric resonant filter having frequency characteristics exhibiting a low frequency side attenuation extremum N1 (Fig. 11b) and a high frequency side attenuation extremum N2 arranged on opposite sides of a pass band, the filter comprising: a plurality of thin-film piezoelectric resonators (see e.g. Figs. 1a, 2, 3a and 4a) being series resonators 3 and 14 and parallel resonators 2 and 15, with each of the resonators including a piezoelectric thin film 22 and a pair of electrodes 26 and 24 disposed on opposite surfaces of the piezoelectric thin film 22; wherein the series resonators 3 and 14 provide the high frequency side attenuation extremum N2 and the parallel resonators provide the low frequency side attenuation extremum N1 (see col. 27, lines 23-29), and wherein the shunt resonators have two membrane layers

Art Unit: 2817

(see col. 27, lines 19-21 and Tables 3 and 4 at cols. 23-24) and the series resonators have only one membrane layer, with all other layers being the same, the piezoelectric is ZnO (see col. 25, lines 11-16) and the membranes are SiO₂ (see col. 24, lines 62-64 and col. 25, lines 5-6), such that the parallel resonators with a total membrane thickness of 312nm must inherently provide the frequency at the low frequency extremum N1 with a rate of frequency change in accordance with temperature that is "different from that" at the frequency at the high frequency extremum N2 provided by the series resonators that have only a membrane thickness of 62nm.

That is, the rate of frequency change in accordance with temperature inherently must be different at the two extremum N1 and N2 because the thickness of all of the layers of the resonators providing these frequencies are equal except for the membrane layers, and the ZnO and SiO₂ layers inherently have opposite (plus/minus) signs of temperature coefficients of elastic constants, as can be found in any art related textbook, and as admitted by Applicants (see section [0072]). Therefore, the series resonators with a combination of ZnO of thickness 2362nm and SiO₂ of thickness 62nm must have a different rate of frequency change in accordance with temperature than the parallel resonators with a combination of ZnO of 2362nm thick and SiO₂ of 312nm thick.

Allowable Subject Matter

7. Claims 6-20 are allowable over the prior art of record.
8. Claims 2-5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Art Unit: 2817

9. The following is a statement of reasons for the indication of allowable subject matter:

Due to the presence of "X" references for claims 1-5 on the European Search Report dated 08 April 2004, the following comments are considered necessary.

Regarding claim 2, wherein Ella discloses the invention as discussed above such that the rate of change of frequency in accordance with temperature is different at the two extremum N1 and N2 provided by the parallel and series resonators, respectively, it does not provide at least one of the series or the parallel resonators in a ladder filter with a "rate of resonant frequency change in accordance with temperature change close to zero" (see claim 2, lines 3-4 and 8-11). The prior art shows that when using a temperature compensation layer of SiO₂ and a piezoelectric layer of ZnO, the ratio of their thicknesses t_s and t_p , respectively, should be about 0.53 for a temperature coefficient of frequency (TCF) to be close to zero (see e.g. U.S. 6,556,103 at col. 7, lines 48-58 and Fig. 12). The layer thicknesses of Ella do not meet this requirement, and Ella with its specific thicknesses does not lend itself easily to modification. Furthermore, although the prior art teaches that it is advantageous to use thin film piezoelectric resonators with TCFs close to zero in ladder filters, (U.S. 6,556,103 from col. 7, line 48 to col. 8, line 15 and Fig. 13), this would tend to suggest that all of the resonators, both series and parallel, have TCFs close to zero, such that the claim 1 limitation that the TCF at the lower extremum formed by the parallel resonators and the upper extremum formed by the series resonators be "different", cannot be met. In other words, the prior art teaches either: (1) that the TCFs of series and parallel resonators

Art Unit: 2817

are "different" due to the presence of partially temperature compensating tuning layers; or (2) that all resonators in a ladder filter should be adjusted to have TCFs close to zero, in which case they are the same and not "different", but the prior art does not teach or suggest the combination of these features. The "X" references on the European Search Report are considered to teach temperature compensation such as in element (2) above, but are not considered to teach or suggest making the TCFs of the lower extremum/parallel resonators and upper extremum/series resonators "different".

Regarding claims 6, 11 and 16, paraphrasing, the prior art of record does not disclose a duplexer having the recited transmission and reception filter, and also wherein the "rate of frequency change in accordance with temperature change" at the high or low side frequency "extremum" of one filter pass band that is "nearer to" the other filter pass band is "lower than the rate of frequency change in accordance with temperature change at the other frequency" exhibiting the other high or low side extremum (see the last paragraph of each of claims 6, 11 and 16).

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Shibata et al. U.S. 6,556,103 discloses using temperature compensated thin film resonators in ladder filters.

Kitamura et al. U.S. 6,441,539 also discloses temperature compensated thin film piezoelectric resonators and appears to be an equivalent of EP 1 100 196 (cited by Applicants).

Inoue et al. U.S. 4,456,850 also discloses temperature compensated thin film piezoelectric resonators.

Tikka et al. U.S. 6,407,649 discloses thin film piezoelectric resonators in transmitting and receiving filters of a monolithic duplexer (Fig. 5), wherein the series and parallel resonators will have different TCFs due to the presence of SiO₂ "shunt tuner" layers on the parallel resonators and "Tx tuning layers" on both resonators of the TX filter, and due to the SiO₂ top layers of the "other structure" that is an acoustic mirror (see e.g. Fig. 1). The series resonator in the TX filter and the parallel/shunt resonator in the RX filter appear to have the same layers and so the same TCF.

Ylilammi U.S. 6,051,907 discloses thin film resonators tuned by changing the thickness of a SiO₂ membrane (see Figs. 6a and 6b).

Barber et al. U.S. 6,307,447 discloses a thin film resonator ladder filter with a tuning layer 46 (Fig. 3) on the parallel resonator making the TCF different from the series resonators.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barbara Summons whose telephone number is (571) 272-1771. The examiner can normally be reached on M-Th, M-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 271-1769. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2817

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

bs
March 25, 2005

A handwritten signature in cursive script that reads "Barbara Summons". The signature is written in black ink and is positioned above the printed name and title.

BARBARA SUMMONS
PRIMARY EXAMINER